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ABSTRACT

Methods for accumulating detailed costs of the experimental leaderships course developed by Westinghouse Learning Corporation for the United States Naval Academy (the final report appears under EM 010 418, EM 010 419, and EM 010 484), as well as proposed methods of reporting cost-effectiveness, are described in this report. Related documents appear under EM 010 418 through EM 010 447 and EM 010 451 through EM 010 512. (Author/RH)

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Westinghouse Learning Corporation

LEADERSHIP COURSE - PHASE I

COST EFFECTIVENESS

CONTRACT NO. N00600-68-C-1525

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COST EFFECTIVENESS

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Abstract

This report is an overview of WLC's methodology for determining the relative cost effectiveness of total instruction and instructional units within the USNA multimedia Leadership Course. Cost effectiveness will be represented in table form. Cost per baseline and module development will be compared with validity indices for instructional effectiveness.

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		Page
I.	OVERVIEW	1
II.	COST COLLECTION SYSTEM	5
III.	COST EFFECTIVENESS REPRESENTATION	15
	A. Total Instruction Cost Effectiveness	15
	B. Module-Specific Cost Effectiveness	17
	C. Interpretation of Cost Effectiveness Tables	20

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The rationale for cost effectiveness reporting is derived from the need to weigh the relative merits of one medium or presentation form against another when both are of equal instructional effectiveness. That is, when two media or presentation forms produce equivalent results, the cost of developing, implementing, maintaining, and revising each becomes a relevant factor.

Since the cost per module selection within the Leadership Course will be absolute costs incurred by WLC, it is doubtful that the results will be highly generalizable. Reasons for the lack of generalizability are the personnel and production facilities owned or accessed by WLC which may be discrepant among other institutions. At best, the costs reported in connection with the course developments model will represent one standard against which costs incurred by other agencies in developing similar instruction can be compared.

The basic methodology to be employed is (1) the systematic collection of labor and non-labor costs associated with both baseline costs for total module development and module-specific costs for independent modules; (2) the comparison of accumulated costs to the relative effectiveness of modules and groups of modules as indicated by the validity indices.

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course development. As such, the cost accounting system is devised to isolate those costs which are specific to the multimedia instructional system and those which are tangential or irrelevant in the actual development.

The specific objectives of the cost accounting system in relation to cost effectiveness studies are:

1. to provide baseline costs for the replication of the course development model.
2. to provide module breakdown costs for material preparation across media and presentation forms.

Cost represented in cost effectiveness studies will be identified with respect to these two major objectives, i.e., as baseline or averaged costs per module development and module-specific, or actual cost per module development.

It should be pointed out that although the cost accounting system is based on the course development model (TP.6.1), there are necessary discrepancies between some of the tasks identified

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cost accounting system. Reasons are that some tasks must be performed in groups to initiate subsequent tasks within the same general area. The components of the tasks may be of such magnitude that they would change another task, and yet they serve to be important for the course development model only when viewed in combination with other related tasks.

Although specific tasks identified in the course development model and cost accounting system may not be identical, all of the cost accounting function areas are included and recognizable in the development model. The additional function areas specified in the latter paper, such as project management and customer interaction, do not carry costing numbers, yet they are necessary as links for the other functions.

Major function areas included in the present cost accounting system are:

1. Project coordination and liaison
2. Research design
3. Secretarial
4. Analysis and course design
5. Presentation design
6. Work for the office of education
7. Production and control

Of these function areas, only work for the Office of Education is not included in the Course Development Model, since the tasks included under that function are terminal tasks and do not serve to initiate subsequent tasks.

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In the 13 digit sequence, the above task would be represented as 1501007IGAB41, where:

15010	designates the function area of analysis and course design
07	designates the task of preparing terminal objectives
I	is a standard Westinghouse separator
G	designates analysis activity
A	designates salaried activity
B41	designates budget center

Non-labor costs which are connected with the task will be charged against the same 13-digit designation with the exception of the activity designations. For example, if the charge is travel, the activity designation would be GD, where G is analysis and D is travel. If the charge is for a book or other material the activity designation would be AB, where A is administrative and B is material or service.

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All labor detail sheets and non-labor detail sheets are submitted weekly to the MLC computing system. In addition to labor itemization, printouts are made of specific non-labor charges with respect to the item purchased or rented and the draft number of the order. In this way, it is possible to verify the appropriateness of the non-labor charge to both the function and task area and to the baseline course development pool.

It should be noted that as new tasks are identified, they can be added under the appropriate function area up to 99 tasks. Task numbers will be added as both new labor and non-labor needs arise.

The second relevant aspect of the cost accounting system is the isolation of specific module costs for material preparation across media and presentation form. These costs are the specific costs incurred in finalizing materials for a module after the content has been specified and analyzed. Accounting for module-specific costs will be accomplished by use of a separate 13-digit alpha and numeric extension number under the general function area of writing.

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000 may take additional values of variable numbers when it is desirable to sort expenses on the variable.

GA designates analysis and salary.

1 designates the area of materials development (2, 3, and 4 could designate implementation, maintenance, and revision).

4 is the last digit of the function area.

1 designates general writing task.

Non-labor charges can also be made against module development in the following way: 15014011ABB141, where:

A designates administrative.

B designates material or service.

The extension number is then the same as the example for labor charges with the exception of the two alphabetics which designate non-labor, e.g., 14022000AB141.

In order to ensure accuracy in labor and non-labor charges to baseline development costs and module-specific costs, all WLC personnel assigned to the USNA project will be supervised in pre-

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15007 03	Interdivision coordination
15007 04	Customer interaction
15007 05	Coordination with USNA staff for overall control objectives (meetings, etc.)
*15007 06	In-classroom evaluation
15007 07	Orientation to USNA
15007 63	Cost accounting
15007 65	Technical papers
15007 66	Work on monthly and quarterly reports

Research Design

15008 01	General work on design of research and evaluatio
15008 02	Design and development of student data base
*15008 03	Design and development of effectiveness measures
*15008 04	Design of module characteristics
15008 05	Interaction specifications for data processing

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Analysis and Course Design

General

*15010 01	General number for applying principles of behavior to course design
*15010 02	General number for technical edit of materials
15010 03	All work related to presentation design or input for all research design
*15010 04	SME time on general course content or design
*15010 05	For charges related only to preparation of reports for course content outline
*15010 08	General number for preparation of preliminary course content outline

Terminal Objectives

*15010 06	SME work on preparation of terminal objectives
*15010 07	Preparation of terminal objectives
*15010 09	Behavioral edit of terminal objectives (may not be relevant)
*15010 10	For effort relating only to reports on terminal objectives
15010 11	For effort relating only to preparation of a conflicting views report on terminal objectives (if required)

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*	15010 21	Behavioral edit of all materials in segment documentation package - flowcharts, test specifications, storyboard, etc.
*	15010 22	Prepare bibliography for each segment
*	15010 23	Work on preparation of segment documentation package report
	15010 24	Conflicting views report on segment documentation package report (if necessary)
*	15010 25	Behavioral edit on written modules
*	15010 26	Behavioral edit on teacher manual
*	15010 27	Behavioral edit on administrative tests
	15010 30	Staff training
	Tests	
*	15010 31	Preparation of tests
*	15010 32	Behavioral edit of tests

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15012 01	General work
15012 02	Course development model
15012 03	Sequencing rationale paper
15012 04	Work schedule
*15012 05	Course strategy
15012 06	Cost effectiveness paper
15012 07	Use of PERT

Production and Control

15013 01	General number for establishing and ensuring compliance with submitted formats
15013 02	Monthly and quarterly reports
15013 03	All P & C effort on technical reports or technical papers
*15013 04	Terminal objectives
*15013 05	Enabling objectives
*15013 06	Specification of presentation design for modules

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*	[illegible]	[illegible]
*	[illegible]	[illegible]
*	[illegible]	[illegible]
*	[illegible]	[illegible]
*	[illegible]	[illegible]
*	[illegible]	[illegible]
*	[illegible]	[illegible]
*	[illegible]	[illegible]
*	15013 63	Packaging for instructor evaluation
*	15013 64	All product design
	15013 62	Specifications for subcontract bids
	15013 63	General coordination or supervision of P & C effort not applicable to specific material
	15013 69	General number for P & C support of project coordination

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Effectiveness measures to be considered in the cost comparisons are the several validity indices which have been discussed in Research and Evaluation Plans (TR.6.3a Part I). Basically, the indices are the gain score ratios or percentages for evaluating overall instructional effectiveness, and the 90% - 90% criterion for evaluating the effectiveness of independent modules.

Costs to be compared against these indices are (1) baseline costs for course development and (2) module-specific costs which are broken down into four phases of development, implementation, maintenance, and revision.

Development costs are directly associated with writing instructional materials, acquiring source material, and programing computer aided instruction.

Implementation costs are associated with printing, producing, and mailing materials; renting films; and preparing instructors'

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A. Total Instruction Cost Effectiveness

Cost for the course development model can be compared against both the total gain score ratio for all students and the gain score ratios for individual students in the experimental course. The gain score will give the percentage of information learned from the system with respect to how much could be learned and how much was learned. As in all other effectiveness studies within the Leadership Course, cost/per individual student gain from the system will be compared against student characteristics, student preference, student time, and student remediation frequency.

Total costs for the course development will be based on base line costs for development, implementation, maintenance, and revision plus costs for the total number of modules developed. It is expected that these costs will be somewhat inflated since there will be more than one module per segment. However, assuming that all modules are left intact in future course administrations as

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mine overall cost effectiveness for all students, both the median gain score percentage and mean gain score percentage can be computed and compared to total cost.

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65-69%	///
60-64%	////
55-59%	//
50-54%	/
45-49%	/
40-44%	
35-39%	
30-34%	
25-29%	
20-24%	
15-19%	
10-14%	
5-9%	
0-4%	

(Example based on distribution of 50 students)

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TABLE II

MODULE DEVELOPMENTAL COST/EFFECTIVENESS

BASED ON 90% - 90% CRITERION

No. of Items Correct / Module Identification	90% Students					80% Students					70% Students				
	90	80	70	60	50	90	80	70	60	50	90	80	70	60	50
Mod.1M2S1D2R1RDF3M1MF3C			$$$				$$$					$$$			
Mod.2M4S1D2R1RDF3M1MF3C		$$$				$$$					$$$				
Mod.N															

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Entries for Module #2 are based on the following hypothetical distribution:

Items Correct	Number of Students
9	40
8	5
7	4
6	1

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but also to average across modules having the same characteristics and functioning at the same level of effectiveness. Averaged costs for modules of the same characteristics and levels of effectiveness will be depicted in a table identical to Table II. The only difference will be that the number of modules pooling into the average will be entered in the appropriate cell along with the averaged cost. It is felt that averaged costs per module development will present a closer approximation of theoretical costs than will single module costs.

In addition to developmental costs per module and per groups of identical modules, the basic format for Table II will be replicated for implementation costs, maintenance costs, revision costs, and total costs. From each table then it is possible to determine the source of the greatest expense associated with selection of a particular media and presentation design form.

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